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ABSTRACT

The instruction of finger counting and finger calculation, also known as Chisanbop, is promoted as a natural method of introducing and teaching the basic processes of addition, subtraction, multiplication and division to children, particularly to those who are mentally and physically handicapped. The sequential process for teaching finger calculations is outlined, with diagrams, as a sequential procedure. Finger calculation is presented as a natural vehicle to learn mathematics for young children because it involves psychomotor activity, sense of touch, visual stimulation, and provides a natural bridge between sensory input and intellectual interpretation. Finger mathematics is seen to provide an environment for effective and efficient learning to take place by having a psychomotor base which is compatible with the learning style of children. It is cautioned that finger calculation is not a panacea or replacement for regular mathematics curriculum and classwork, but should be used as an introductory reinforcement and supplemental technique. (MP)

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FINGER MATHEMATICS: A METHOD FOR ALL CHILDREN

Earl J. Ogletree and Maria Chavez

Many handicapped children leave school with mathematical deficiencies. They do not attain mathematical skills much beyond the fourth grade. The major problem appears to be one of methodology, i.e., finding a meaningful method of teaching that is concrete and related to the learning style of EMR children.

Manipulatives are generally used to teach and reinforce understanding of operations, concepts and abstractions. Although working with concrete objects involves motoric skills, it does not fully involve the children in the learning process. Use of manipulatives is more abstract than it is concrete when compared to the direct use of the fingers.

Fingers are a common vehicle for non-verbal communication for young children. They use them to play with toys and objects, to point things he see or want and to count. Finger counting and calculation is not only used by children in primary grades, but children who have failed to intellectualize the four basic arithmetical processes rely on finger calculations. It appears finger manipulations would be a natural method of introducing and teaching the basic processes of addition, subtraction, multiplication and division to children, particular EMR children.

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Of recent a finger system of calculation was developed. This system known by various names such as sensory math, fingermath and finger calculation or by its original name Chisanbop, developed by Hang Yung Pai in Korea.

Basically, finger calculations is a finger manipulative method of performing the four basic operations with whole numbers, executed by the ten fingers. The right hand represents the units place, the left hand the tens place and by means of a systematic sequence of finger positions one can count to 99. For numbers above 99, the sequence is repeated.

Teaching finger calculation is not difficult; drills is an integral part of the process. A sequential procedure must be followed.

First the numerical value of the fingers must be learned. Begins with the right hand. Each finger has value of one and the thumb has a value of five. Ask the children to think of pennies and nickles. Pressing is accomplished by placing (pressing) fingers on a surface. Clearing refers to releasing fingers from the surface. (see figure 1)

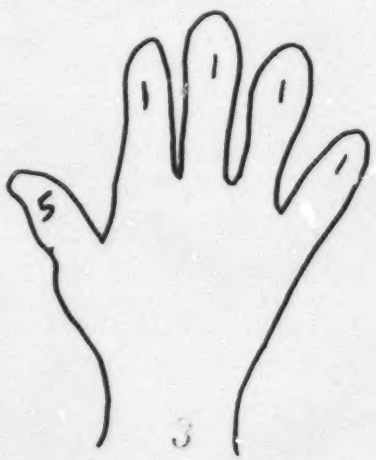

FIGURE 1

The children should begin with the right hand pressing 1, 2, 3, 4, 5, 6, 7, 8, 9 in sequence then randomly drilled until mastery is attained. The lesson should be about fifteen minutes. Teacher should proceed slowly and carefully so as not to introduce new skills until preceding skills have been mastered. It is important that the children not be frustrated.

Teaching of addition to sums of ten using only the right hand should be introduced next. For the immature or slow learner only pressing to four or six should be practiced first. For older and faster learners the left hand could be introduced.

Since finger calculations is based on the decimal system, the left hand represents values of ten. Each finger is ten, the thumb is fifty (think dimes and fifty cent pieces.) Have the children press 20, 40, 60, 90, 10, etc. (see figure 2.)

Figure 2

The following step is to use both hands. Students would press 52 (press thumb left hand and press two fingers right hand.) Here the students become aware of numerical values of each hand. Ultimately they should be able to count and add numbers up to 99. The number that will require additional drill are those that contain the digits of 6, 7 or 8 in the ones or tens place.

In the addition of numbers with sums above 4, the 4-5 exchange needs to be taught. For example 2 + 3 involves the pressing of two fingers plus three fingers. Count "one, two," flip to thumb, three (4-5 exchange). Read finger (thumb)--"five."

Sums of ten and involve the nine - ten exchange. For example 7 + 5 involves the pressing of seven and six more. Press right thumb and two fingers. Then press ring and little finger (the entire right hand is pressed.) Jump to index finger to left hand (10) and make 9-10 exchange. Holding lift thumb down, press index and middle fingers on right hand. Read fingers--"twelve."

Finger manipulation for subtraction is the reverse of addition. For example, to perform 4-3, simply press four and then release 3 fingers from right to left, while counting one, two, three. Read fingers-- "one."

Multiplication is repeated addition. The child begins with two tables by first pressing two, then two more and two more, etc. For example 2×4= would involve pressing two four

times. Then read fingers, "eight." Although the process may appear difficult, it is not. Children develop a rhythm and speed which become unconscious by simple practice. The five and nine tables are the most fun in that it requires a simple exchange of fingers of the right and left hands.

For example in the nine tables, the child presses nine (thumb and four fingers of right hand). To add nine more press a ten (index finger of left hand) and release little finger of right hand, equals 18.

Division is a little more difficult, but not impossible. For example in the problem 18 ÷ 9, the question is asked how many 9's are in 18? The child presses 18 and reverse the multiplication process and subtracts one 9, then next 9. The answer is 2.

The writers have seen five year olds using the finger calculations competently, swiftly and joyfully. One of the authors (Maria Chavez) successfully taught her four and six year old girls finger calculation, even though the younger child had little or no number concept, i.e., she did not know how much 10 was. Maria Chavez has taught calculation system to non-handicapped and handicapped, teachers and administrators.

Finger calculation is a natural vehicle to learn mathematics for young children because it involves

psychomotor activity, sense of touch and visual stimulation, it provides a natural bridge between sensory input and intellectual interpretation.

Children best learn mathematical concepts and skills by first experiencing numbers physically, then visually, then emotionally and lastly conceptually.

In summary:

Steps in Learning	Finger Calculation
1. Associating number experiences to physical movement.	1. Pressing of fingers
2. Associating number experiences to seeing.	2. Visual consciousness (watching fingers).
3. Associating number experiences to feeling and hearing.	3. Individual oral and choral recitation.
4. Associating number experiences to thinking.	4. Intellectu al interpretation.

Learning is hardly ever a purely cognitive process for children. It includes physical and emotional involvement --interest, motivation and preference. Therefore, for effective and efficient learning to take place, the methods of learning must be compatible with the learning style of the children.

Finger Calculations appears to meet these criteria because of its psychomotor base. Steiner (1964) agreed with this approach:

> The less we train the intellect directly and the more we aim at treating (teaching) the whole child in such a way that out of motoric

> activity, out of the dexterity the intellect will evolve. Learning to think directly through the head is not the kind of (learning that will last for young children). He will become tired and disinterested. But if he has to do actions with his own body which need to be thought out first, this will develop thinking in the proper way. (Learning will be facilitated and retention increased p. 25).

This has some logic. Learning and eventually becoming proficient in a skill is the forgetting of the process. We acquire the ability to write because we have forgotten the process which has sunken into the subconscious. Perfection is in the forgetting of the learning process. As a result of using finger calculations to facilitate the learning of the four mathematic operations, mathematical skills emerge as an ability because the physical/oral/cognitive experience has sunken into the subconscious. Learning finger calculations is similar to learning a musical instrument or learning a sport-- skating or skiing-- in that the basic skills of finger calculation must be learned thoroughly before moving one to more complex manipulation skills. Practice is essential. Although finger calculation is relatively simple, the tempo of the teaching process must be slow to maintain confidence and motivation. Speed is not encouraged.

Finger calculation is not a panacea or replacement for regular mathematic curriculum and classwork. It is an introductory reinforcement and supplemental technique.

Oral recitation is used to accompany the pressing of numbers with the fingers as an integral facet of finger calculations. Oral exercises and choral counting helps to focus the children's thinking and reinforce finger manipulations. It gives the teacher the opportunity to evaluate their progress and to correct inappropriate calculation patterns. The multimodes of learning (visual, auditory, oral, touch and psychomotor) using finger calculations provides a natural and compatible media for children of all abilities, including the handicapped. For children with laterality difficulties or poor motor-visual skills or auditory coordination, finger calculations not only facilitate the learning of mathematical skills, it can help to ameliorate their handicapping conditions.

Finger calculations has become increasingly popular and effective in the United States with all kinds of children, young to older, handicapped to non-handicapped. It has been shown that young children who have learned the finger calculation system can add, multiply, subtract or divide numbers faster than an adult using an electronic calculator. The issue is not the speed in finding answers to problems, but the feasibility and applicability of using finger calculations to enhance arithmetical understanding and skill development of handicapped and non-handicapped children.

Several research studies have shown the finger calculation method to be successful in increasing academic

achievement. A study project conducted by the Texas Education Agency (1978) included eleven first and second grade, ten third grade and fourteen remedial fifth grade classes selected on a random basis. An equivalent control group was used. Both groups were given a pretest and a post test after sixty days of instruction. An analysis of covariance showed a statistically significant difference favoring each experimental grade level.

A later study of Chavez (1980) comparing the arithmetic achievement of twenty-nine Chicago, black inner-city second grade students taught by the finger calculations with twenty-seven control group students. After five months of instruction, the finger calculation group scored significantly higher (.05) on the IOWA test in arithmetic than the control group.

Gurua and Ineberthal (1979) found their finger math system to be successful with all children:

> A year of involvement...of both normal and obviously handicapped children has demonstrated... that exposure to finger math techniques is helpful as well as enjoyable for the children (p. Viii).

The procedure for teaching finger calculations to handicapped children does not appreciable differ from those for non-handicapped children except to proceed at a slower rate with more reinforcement. An advantage of finger calculations is that it lends itself to easy diagnosis, and individual one-to-one instruction by another student or

a sibling or parent at home. Because of its multi-sensory, multi-active approach, it provides many avenues for all children to learn.

> Activity for children is synonymous with play; play begets motivation, and motivation begets learning. Finger calculations (finger play) is a method "whose time has come" for implementation in the special education curriculum.

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